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Influence of Psychological Stress on Physical Pain

조선대학교 대학원

의 학 과

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심리적 스트레스가 신체적 통증에 미치는 영향

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목적 : 본 연구의 목적은 일반 인구에서 병적이지 않은 신체적 통증에 대한 심리적 스트레스의 영향을 알아보기 위한 것이다.

방법 : 자료는 자가보고 질문지를 이용하여 91명의 비환자군에서 통증의 부위와 강도에 더불어 스트레스의 원인, 스트레스의 반응 및 대처방식을 추출하였다. 질문지는 스트레스인자 지각 척도(Global Assessment of Recent Stress), 스트레스 반응 척도(Stress Response Inventory), 대응 척도(Ways of coping checklist)로 구성되었고, 스트레스와 관련된 통증의 부위와 강도를 표시하도록 하였다.

결과 : 통증의 심각도는 스트레스의 정도에 비례하였고, 또한 스트레스의 반응 정도와 대처방식은 통증의 심각도에 중요한 역할을 하였다. 게다가 재정 상태, 질병이나 손상으로부터의 스트레스, 신체화는 연구 집단에서 통증의 심각도의 좋은 예견 인자였다. 스트레스와 관련된 통증으로는 후두부 두통이 제일 흔하였고, 통증 부위는 특정한 스트레스 변수에 달려있다. 통증을 많이 호소하는 집단과 통증이 없는 집단은 특정 인구학적, 스트레스 변수와 관련이 있음을 보여주었다.

결론 : 심리적 스트레스의 다양한 양상들이 신체적 통증의 발생, 부위와 강도에 영향을 미친다.

중심단어 : 심리적 스트레스, 신체 통증, 정신신체화, 일반 인구

I. Introduction

It is generally accepted that psychological stress can cause or worsen physical pain. Previous investigations have demonstrated that psychological stress is positively correlated with incidence (Diepenmaat, van der Wal, de Vet, & Hirasing, 2006) and intensity (Ullrich, Turner, Ciol, & Berger, 2005) of physical pain. It has also been reported that psychological stress increases the sensitivity to pain (Leistad, Sand, Westgaard, Nilsen, & Stovner, 2006).

In the past, most studies assessing stress-related pain have focused on the interaction of stress and pain in patients with a certain disease, or on the difference of the interactions between patients with two different diseases. This study examined the interaction of stress and pain in a general population with a focus on psychological stress as a cause or determiner of pain.

Stress can be assessed from three different perspectives: cause of, response to, and coping with psychological stress. The objective of the present study is to determine how such various aspects of psychological stress affect the incidence, site, and intensity of stress-related physical pain in a general population. For this purpose, we conducted a questionnaire survey of 133 non-patient subjects.

II. Methods

This study was approved by the Institutional Review Board of Chosun University Hospital, and the subjects involved granted their informed consent to participate in the study.

1. Subjects

The initial study population consisted of 133 people who attended a public educational event held by Gwangju-jeonnam Branch of Korean Neuropsychiatric Association, on the Day of Mental Health (April 4, 2007). The individuals who consented to participate in this study received a 30-min introduction and instruction on the questionnaire with respect to what each question means, and the different options for response. Of the 133 initial subjects, 29 were excluded from the analysis due to insincere or incomplete answers. We also excluded records of subjects who had a confirmed diagnosis in the area of pain or in the brain. We discovered 6 cases of arthritis, each one case of vertebral disc herniation, cervical sprain, and sciatica, 3 cases of organic brain disease, and a case of schizophrenia. As a result, a total of 91 records comprised of 52 men and 39 women aged 20～77 (mean ± SD = 37.33 ± 16.09) were included in data analysis.

2. Measures

Data pertaining to the source of, response to, and coping with psychological stress, as well as the site and intensity of physical pain was collected on 91 subjects using a self-report questionnaire. The questionnaire consisted of 4 scales: Global Assessment of Recent Stress (GARS) (Linn, 1985), Stress Response Inventory (SRI) (Koh, Park, & Kim, 2000), Ways of Coping Checklist (WCC) (Folkman & Lazarus, 1985), in addition to Site and Intensity of Stress-related Pain (SISP).

The GARS assesses the degree of stress from the 8 different sources (Table 1) during the past week on a scale of 0 to 9. We used a Korean version of this scale, of which the validity and reliability were tested on a Korean population (Koh & Park, 2000).

The SRI is composed of questions about physical, emotional, and behavioral responses induced under stressful circumstances during the past week. The frequency of experiencing each response is rated on a scale of 0 to 4, with 4 as the highest. We used a Modified form of the SRI for Workers (Choi, Kang, & Woo, 2006), which consisted of 22 items, and was standardized in Korea. A factor analysis performed by the developers identified somatization, depression, and anger as factors.

WCC is pertinent to the ways one copes with psychological stress. The items are required to be answered on a scale of 0 to 3 according to how often a coping strategy is used, with 3 as the most often. In this study, we used an abbreviate Korean version (Kim, Cho, & Pyo, 1996), which contains 20 items consisting of each 5 items from 4 factors, i.e., problem-focused coping, seeking social support, emotion-focused coping, and wishful thinking. The selected items have the highest factor loading in each factor.

For this study, we devised SISP that asks subjects to rate the intensity of pain in 21 areas on a scale of 1 to 3, with 3 as the severest, when the pain in the area is thought to be caused or worsened by psychological stress. Twenty-one areas of pain include the forehead, occiput, throat, anterior and posterior aspects of the neck, shoulder, upper arm, forearm, fingers, chest, epigastrium, low back, periumbilical area, low abdomen, buttock, thigh, knee, shin, calf, ankle, and toes.

3. Statistical analyses

The differences of SISP scores depending on the demographic variables are analyzed by the two-tailed t test, analysis of variance, and Pearson's or Spearman's correlation analysis with respect to the types of the variables. A correlation analysis was performed to estimate the associations between each of GARS, SRI, and WCC and the total score of SISP. We performed the multiple regression analysis to develop a model that may best predict the total SISP score from the economic and stress variables. A partial correlation analysis was performed to identify more painful areas as a function of each stress variables, adjusted for the confounding demographic variables for each pain site.

The demographic variables of 25 subjects who reported no physical pain and those of 24 subjects who rated 7 or more on SISP were compared by the Fisher's exact test for categorical variables, and by the independent t test for continuous variables. The stress-related variables of the 2 groups were compared by the analysis of covariance, adjusted for the demographic variables that were significantly different between the 2 groups. All statistical analyses in this study were conducted by using SPSS version 12.0 (SPSS Inc., Chicago, IL, USA).

III. Results

The demographic variables included in this study were age, sex, economic status, religion, education, marriage, and employment status. The total SISP score (mean ± SD = 5.12 ± 6.75) did not differ depending on most demographic variables, except for economic status. The mean (SD) SISP scores of low (N = 31), middle (N = 49), and high (N = 4) economic status groups were 8.94 (8.22), 2.45(8.22), and 5.75 (8.50), respectively (Spearman's ρ = - 0.42, P < .001). In addition, the correlation of age with total SISP score reached borderline significance (r = 0.20, P = .06).

Table 1. Correlations between the stress variables and total SISP score

Stress variables	r	*P*
GARS		
Work, job, and school	0.35	.001
Interpersonal relationship	0.28	.010
Changes in relationship	0.04	.717
Sickness or injury	0.36	.001
Financial problem	0.23	.036
Unusual happenings	0.16	.139
Changes or no change in routine	0.33	.002
Overall global	0.31	.005
Total sum of GARS	0.44	<.001
SRI		
Somatization	0.34	.002
Depression	0.31	.004
Anger	0.34	.002
WCC		
Problem-focused coping	0.06	.611
Seeking social support	0.13	.235
Emotion-focused coping	0.23	.035
Wishful thinking	0.08	.494

r = partial correlation coefficients adjusted for economic status; GARS = Global Assessment of Recent Stress scale; SRI = Stress Response Inventory; WCC = Ways of Coping Checklist.

The correlations between each of GARS, SRI, and WCC and total SISP score adjusted for economic status are presented in Table 1. The sum of the 8 individual GARS items were most strongly correlated with total SISP score. Among the individual items, 'sickness or injury' was the most strongly correlated variable with total SISP score, followed by the 'work, job, and school' and 'change or no change in routine.' The item 'change or no change in routine' inquires about the stress from trivial changes or boredom (no change) of an individual's daily living routine. All 3 factors of SRI, i.e., somatization, depression, and anger, showed significant correlations with the total SISP score. Emotion-focused coping, a factor of WCC, was significantly correlated with total SISP score.

Table 2 shows the results of the multiple regression analysis performed to develop a model to predict the total SISP score. We formulated several preliminary models based on the results of the univariate analyses, and finally decided upon a model with a maximum adjusted coefficient of estimation (R^2). The model consisted of 3 variables including economic status, degree of stress from 'sickness or injury', and the frequency of 'somatization' response. The three variables accounted for 30% of the variation in the total SISP scores in our study population (R^2 = 0.30, adjusted R^2 = 0.28, P< .001).

Table 2. Multiple regression of the three predictor variables on total SISP score

Predictor variables	Standardized β	t	*P*
Economic status	0.35	3.69	<.001
Sickness or injury	0.24	2.37	.020
Somatization	0.22	2.10	.039

r = partial correlation coefficients adjusted for economic status; GARS = Global Assessment of Recent Stress scale; SRI = Stress Response Inventory; WCC = Ways of Coping Checklist.

Table 3. The pain areas which are significantly correlated with the stress variables, adjusted for the confounding demographic variables for each area

	GARS									SRI			WCC			
	W	I	C	S	F	U	R	O	T	S	D	A	P	S	E	W
Forehead				+					+	+						
Occiput		+		+		+			+	+	+	+		+		
Throat													−			−
Neck, anterior			+													
Neck, posterior	+			+			+	+	+						+	
Shoulder	+							+		+		+		+		
Upper arm				+					+			+				
Forearm				+												
Fingers	+												+		+	
Chest	+	+					+		+	+	+	+				
Epigastrium							+			+	+	+				
Lower back	+	+					+	+	+							
Periumbilical				+	+				+	+		+				
Low abdomen		+	+	+	+	+		+	+	+		+			+	
Buttock																
Thigh												+				
Knee				+			+	+	+	+	+			+		
Shin	+														+	
Calf	+											+				
Ankle				+					+							
Toes																−

+ = positive correlation (*P* <.05), − = negative correlation (*P* <.05), blank = not significant; W of GARS = Work, job, and school; I = Interpersonal relationship; C = Changes in relationship; S = Sickness or injury; F = Financial problem; U = Unusual happenings; R = Changes or no change in routine; O = Overall global; T = Total sum of GARS; S of SRI = Somatization; D = Depression; A = Anger; P of WCC = Problem-focused coping; S = Seeking social support; E = Emotion-focused coping; W = Wishful thinking.

The most commonly reported pain sites were the occiput (36.3%), shoulder (35.2%), and forehead (33.0%). All 21 pain sites were tested for association with demographic and stress variables. The following demographic variables were significantly associated with certain pain sites: age was significantly associated with the throat, upper arms, and fingers; gender was significantly

associated with the occiput and shoulder; economy was significantly associated with the occiput, throat, anterior neck, nape, shoulder, upper arms, fingers, chest, low back, thigh, knee, shin, calf, and toes; education was significantly associated with the chest and low abdomen; and employment was significantly associated with the occiput. The pain areas that were significantly correlated with the stress-related variables are shown in Table 3.

Table 4 shows the comparison between the subjects who reported no pain in any area (N = 25), no pain group and subjects who complained pain of 7 or higher on total SISP score (N = 24), high pain group. The high pain group tended to belong to a lower economic status and had a likelihood of being unemployed. When adjusted for economy and employment, the score of stress from 'work, job, and school', 'financial problem', and 'change or no change in routine', and the score of 'overall global stress' and total GARS were higher in the high pain group than in the no pain group. Also, the high pain group showed the higher score in all 3 factors of SRI than the no pain group, adjusted for the same demographic variables. On the other hand, no significant difference was observed with respect to the factors of WCC.

Table 4. Comparison between the no pain group and high pain group

Variables	No pain	High pain	*P*
Economic status: N (%)			
High	2 (8.7)	1 (4.5)	.001
Middle	18 (78.3)	7 (31.8)	
Low	3 (13.0)	14 (63.6)	
Occupation: N (%)			
Employed	12 (48.0)	15 (62.5)	.032
Student	11 (44.0)	3 (12.5)	
Unemployed	2 (8.0)	6 (25.0)	
GARS			
Work, job, and school	2.04 (1.82)	4.55 (3.53)	<.001
Interpersonal relationship	2.78 (2.52)	4.36 (2.87)	.196
Changes in relationship	1.13 (1.96)	2.27 (2.85)	.176
Sickness or injury	1.65 (2.33)	3.14 (2.98)	.209
Financial problem	1.65 (2.08)	4.27 (3.25)	.012
Unusual happenings	1.17 (2.41)	1.86 (2.40)	.483
Changes or no change in routine	2.09 (2.00)	4.18 (2.58)	.025
Overall global	2.96 (1.58)	4.91 (2.49)	.004
Total sum of GARS	15.48 (9.77)	29.55(13.82)	.001
SRI			
Somatization	7.43 (7.37)	15.55 (6.51)	.001
Depression	6.57 (7.25)	12.68 (6.27)	.004
Anger	5.26 (5.39)	8.82 (4.01)	.016
WCC			
Problem-focused coping	7.57 (3.57)	6.73 (4.18)	.586
Seeking social support	7.09 (2.75)	7.50 (4.06)	.063
Emotion-focused coping	6.17 (2.74)	6.77 (3.52)	.161
Wishful thinking	8.61 (3.41)	8.82 (3.19)	.811

GARS = Global Assessment of Recent Stress scale; SRI = Stress Response Inventory; WCC = Ways of Coping Checklist.

IV. Discussion

The aim of the present study was to identify the stress-related variables which affect the incidence, site, and intensity of stress-related pain common throughout our daily living, unrelated with disease, and comes and goes with little trace of disability.

The analysis of the 91 non-patient subjects' data indicated that the variables from the various aspects of psychological stress as well as demographic variables affect stress-related physical pain in numerous ways. In summary, 1) the total GARS score was proportional to pain severity; 2) the degree of stress response (impact of stress) was positively correlated with pain severity; 3) pain severity increased with 'emotion-focused coping', which is classified as a passive coping strategy (J. H. Kim, 1987); 4) economic status, stress from 'sickness or injury,' and 'somatization' response were the best predictors of pain severity in our study population; 5) the most commonly reported stress-related pain was occipital headache, and the pain sites may be explained by certain stress-related variables; and 6) the comparison of the subjects of high pain group with those of no pain group showed differences in certain demographic and stress-related variables as described in the Results section.

Among the sources of stress in GARS, stress from 'sickness or injury and from 'work, job, and school' are most strongly correlated with pain intensity (Table 1) and produce more number of significantly correlated pain sites than those from other sources (Table 3). Pains in the abdomen, arms, head, and neck are better correlated with the stress from sickness or injury than those in other parts of body. This result, however, may not be interpreted simply, since this item of GARS inquires the stress from sickness or injury of either the subject or the other people around him or her. If the question is narrowed to

the stress from a subject's own sickness or injury, the locations of pain are expected to vary among different social and cultural backgrounds. The pain sites most strongly correlated with work-related stress were the neck, shoulder, and lower back. This results are consistent with earlier studies on office workers (Guic, Bilbao, & Bertin, 2002; Holte & Westgaard, 2002).

Most previous studies investigating the interaction between mental stress and bodily pain are focused on pain of a certain disease or chronic condition (Ader, South-Paul, Adera, & Deuster, 2001; Cheng et al., 2003; Gordon, Panahian-Jand, McComb, Melegari, & Sharp, 2003; Gunther, Mur, Traweger, & Hawel, 1994; Ullrich et al., 2005). Our study focused on common, brief, non-pathologic, and stress-related pain in a general or at least a non-patient population. Results of our study correspond with some earlier studies. In non-patient populations, number of pain sites (Lien, Claussen, Hauff, Thoresen, & Bjertness, 2005), prevalence of pain (Diepenmaat et al., 2006), and severity of pain (White & Farrell, 2006) were associated with psychological stress.

At least 33% of somatic symptoms in primary care are medically unexplained (Kroenke, 2003). Physicians should be aware of psychological stress in patients with physical pain, especially for pain which cannot be medically explained, since various aspects of psychological stress may determine the incidence, site and intensity of physical pain as presented in this study.

References

Ader, D. N., South-Paul, J., Adera, T., & Deuster, P. A. (2001). Cyclical mastalgia: prevalence and associated health and behavioral factors. J Psychosom Obstet Gynaecol, 22(2), 71-76.

Cheng, C., Wong, W. M., Lai, K. C., Wong, B. C., Hu, W. H., Hui, W. M., & Lam, S. K. (2003). Psychosocial factors in patients with noncardiac chest pain. Psychosom Med, 65(3), 443-449.

Choi, S. M., Kang, T. Y., & Woo, J. M. (2006). Development and validation of a Modified form of the Stress Response Inventory for Workers. J Korean Neuropsychiatr Assoc, 45(6), 541-553.

Diepenmaat, A. C., van der Wal, M. F., de Vet, H. C., & Hirasing, R. A. (2006). Neck/shoulder, low back, and arm pain in relation to computer use, physical activity, stress, and depression among Dutch adolescents. Pediatrics, 117(2), 412-416.

Folkman, S., & Lazarus, R. S. (1985). If it changes it must be a process: study of emotion and coping during three stages of a college examination. J Pers Soc Psychol, 48(1), 150-170.

Gordon, A. S., Panahian-Jand, M., McComb, F., Melegari, C., & Sharp, S. (2003). Characteristics of women with vulvar pain disorders: responses to a Web-based survey. J Sex Marital Ther, 29 Suppl 1, 45-58.

Guic, E., Bilbao, M. A., & Bertin, C. (2002). [Occupational stress and health in a sample of chilean executives]. Rev Med Chil, 130(10), 1101-1112.

Gunther, V., Mur, E., Traweger, C., & Hawel, R. (1994). Stress coping of patients with ankylosing spondylitis. J Psychosom Res, 38(5), 419-427.

Holte, K. A., & Westgaard, R. H. (2002). Daytime trapezius muscle activity and shoulder-neck pain of service workers with work stress and low biomechanical exposure. Am J Ind Med, 41(5), 393-405.

Kim, J. H. (1987). Relations of perceived stress, cognitive set, and coping

behavior to depression : A focus on freshman's stress experience. Seoul National University, Seoul.

Kim, S. H., Cho, Y. R., & Pyo, K. S. (1996). A study on the types of smoking and the relationship of psychosocial factors to smoking of college students. Korean J Psychosomatic Medicine, 4(2), 182-197.

Koh, K. B., & Park, J. K. (2000). Validity and reliability of the Korean version of the Global Assessment of Recent Stress scale. Korean J Psychosomatic Medicine, 8(2), 201-211.

Koh, K. B., Park, J. K., & Kim, C. H. (2000). Development of the Stress Response Inventory. J Korean Neuropsychiatr Assoc, 39(4), 707-719.

Kroenke, K. (2003). Patients presenting with somatic complaints: epidemiology, psychiatric comorbidity and management. Int J Methods Psychiatr Res, 12(1), 34-43.

Leistad, R. B., Sand, T., Westgaard, R. H., Nilsen, K. B., & Stovner, L. J. (2006). Stress-induced pain and muscle activity in patients with migraine and tension-type headache. Cephalalgia, 26(1), 64-73.

Lien, L., Claussen, B., Hauff, E., Thoresen, M., & Bjertness, E. (2005). Bodily pain and associated mental distress among immigrant adolescents. A population-based cross-sectional study. Eur Child Adolesc Psychiatry, 14(7), 371-375.

Linn, M. W. (1985). A Global Assessment of Recent Stress (GARS) Scale. Int J Psychiatry Med, 15(1), 47-59.

Ullrich, P. M., Turner, J. A., Ciol, M., & Berger, R. (2005). Stress is associated with subsequent pain and disability among men with nonbacterial prostatitis/pelvic pain. Ann Behav Med, 30(2), 112-118.

White, K. S., & Farrell, A. D. (2006). Anxiety and psychosocial stress as predictors of headache and abdominal pain in urban early adolescents. J Pediatr Psychol, 31(6), 582-596.